SD
11
.A1
A43
No. 557

Global Change

A Resource Guide for Educators

$$2 + 4 = 6$$

Cover art by Carla Geyer, age 10, Fircrest Elementary School, Vancouver, WA.

United States Department of Agriculture

Forest Service

FS 557

Global Change
A Resource Guide for Educators

August 1993

Compiled by Kathleen A. Heidenreich
North Thurston School District
Lacey, WA
EPA Fellow with USDA Forest Service, Region 6
Portland, OR

Foreword

The Pacific Northwest Research Station of the Forest Service provides the information in this publication as a service to educators and others interested in locating sources of information on global change.

Acknowledgments

This project was done for Kathleen M. Geyer, Forest Service Global Change Research Program, Pacific Northwest Research Station, Portland, OR.

The information in this publication was generously provided by all those listed in the entries. I wish to thank these sources for their prompt response so that up-to-date information could be provided.

Notes

The listing of organizations and informational sources should not be considered as USDA Forest Service recommendations. The use of trade or firm names in this publication is for reader information only and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

The policy of the United States Department of Agriculture Forest Service prohibits discrimination on the basis of race, color, national origin, age, religion, sex, or disability. Persons believing they have been discriminated against in any Forest Service-related activity should write to: Chief, Forest Service, USDA, Washington, DC 20250.

Contents

Introduction	4
Limerick	5
What Is Global Change?	5
Government Agencies	6
Organizations	7
Organizations That Involve Kids	11
Newsletters on Global Change	13
Curricula	13
Curricula in Development	16
Selected Articles	16
Selected Books of Interest	17
Reviewed Videos	18
Unreviewed Videos	19
Computer Network	20

Introduction

The USDA Forest Service Global Change Research Program, as part of the U.S. Global Change Program, was established under the USDA Global Change Program as part of the Presidential Initiative for Global Change Research in 1988. The U.S. Global Change Research Program was established under the Global Change Act of 1990. The focus of the U.S. Global Change Research Program is to develop an improved knowledge base about climate and the Earth's system to better understand the uncertain nature of our changing and future environment.

Facilitating information transfer to the public provides the opportunity to share the knowledge gained by scientists. This is one goal of the USDA Forest Service Global Change Research Program. It is important that accurate, scientific information be available to the public because global change is being discussed more and more in the national news and the political arena, and will continue to be frequently discussed in the future. It is anticipated that within the next year the U.N. Climate Change Convention will be ratified by enough countries to go into effect. The more clearly that we understand and have adequate knowledge of climate change, the better we will be able to help the Nation meet its commitments under this convention. Teachers particularly need new information for their students as global change becomes more commonly discussed in science curricula. It is a complex and growing field of interest, not only to researchers, but to decisionmakers around the world.

The resource guide for educators on global change is designed to be a quick guide to information on global change issues that is currently available through a wide number of sources. The guide is a reference directory, not an in-depth discussion on the topic. There are numerous scientific articles and publications available for the individual who wishes to further research the topic. The USDA Forest Service Global Change Research Program is one source of scientific information along with other Federal research agencies listed in this guide. It is part of a larger USDA program in which the National Agricultural Library serves as the principal information source of USDA (for more about the National Agricultural Library, see the Government Agencies section of this publication).

For many teachers (particularly of elementary grades), an in-depth discussion of complex topics—such as the chemical composition of the atmospheric gases or the specific interrelationships of the biosphere to changes in climate scenarios—is too detailed. Many teachers are looking for ways in which students can learn the basics on the topic and do activities, if they are available. This publication contains a variety of sources for various ages. It provides teachers with information on where they can write for newsletters, curricula, videos, posters, and additional educational materials.

The directory provides a quick reference guide to finding the type of information that is needed. Most of the information referenced in the guide has been reviewed. The USDA Forest Service does not recommend any product, company, or service listed in the guide. The listings are intended to be information sources and potential curricular opportunities for teachers.

The USDA Forest Service Global Change Research Program, as part of the USDA Global Change Research Program, conducts scientific research that relates the biological, physical, geochemical, social, and economic processes surrounding global change. Much of the research is designed to answer questions for both policymakers at the national and regional levels and natural resource managers of the national forests. This research becomes the data base for others to use along with research being conducted by other Federal agencies in the U.S. Global Change Program and by universities throughout the country.

Limerick

The Great Global Warming Limerick Debate
(from GEMS* curriculum Global Warming)

"The topic's a hot one at that,"
Said the first, putting on his straw hat,
"Evidence it is forming
That this globe is warming"
And the sweat dribbled down his cravat.

His opponent, unflappably cool,
Said, "please don't take me for a fool -
If the temperature's rising
It isn't surprising
It goes up, then goes down, as a rule."

"Sure, cycles exist," said the first,
Gulping water to stave off his thirst,
"But our excess pollution's
A new contribution
For this reason, I fear the worst!"

"Just put all your worries on ice,"
Said the other, tossing some dice,
"I'd much rather wait
Take my chances with fate
Till the bill is due, why pay the price?"

The outcome my friend's up to you
To find out which side is more true
Before more time passes
Analyze all the gases
And help figure out what to do.

*GEMS, Great Explorations in Math and Science, is an organization that originates curricula. It is connected with the University of California, Berkeley. For further information on GEMS, see the Curricula section of this book.

What Is Global Change?

The term "global change" can be broadly defined as the changes that are occurring on the Earth and in its atmosphere from natural events, natural processes, and human activities. It includes processes that interact with and interrelationships between the environment, atmosphere, and humans. All of these components are dynamic and have always changed over time. Our concern now is the scale of changes and the rate of change.

Our world has not changed in size, but human activities have changed in magnitude. The amount of ocean area or continental surface is the same, but there are more human beings populating the Earth and our activities now reach to all areas on the planet. We need surface to live on and food to eat. The raw materials are collected on all continents except Antarctica. Our wastes are found on all parts of our planet and in the atmosphere. Whether you believe the scientific data and arguments about global change or not, you should acknowledge the human impact on all the planet's environmental systems: terrestrial, aquatic, and atmospheric.

There are many natural events and processes that also cause changes in ecosystems and atmospheric systems. Wildfire, hurricanes, volcanoes, and other such "natural disasters" are part of the Earth's changing surface. Larger scale actions such as the Earth's orbit affect the atmospheric systems. These processes have continued for millions of years and have shaped the environment we have today.

The combination of natural processes and human activities is what global change is all about. The picture is a large one and the interactions are complex and dynamic. The time frame of change is rapidly shrinking and that is what is causing many scientists to seek answers to what our future will be.

This directory provides numerous sources of information for educators on the topic of global change. Major sections include the following: Government Agencies, Organizations, Organizations That Involve Kids, Newsletters on Global Change, Curricula, Curricula in Development, Selected Articles, Selected Books of Interest Reviewed Videos, Unreviewed Videos, and a Computer Network.

Government Agencies

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA), Mail Code SE, Washington, DC 20546-0001.

Information/posters on proposed satellite research on global change.
Information available regarding fellowships in Global Change Research (contact Global Change Fellowship Program).

NATIONAL AGRICULTURAL LIBRARY, Reference Section, Room 111, 10301 Baltimore Boulevard, Beltsville, MD 20705.

Global Change Information Resources Packet includes:
Directory of Global Climate Change Organizations
Guide to Information Sources
Chronology of Global Climate Change
Global Climate Change and Agriculture: A Summary
Global Climate Change Selected Annotated Bibliography (1989-1990)
Global Warming and Greenhouse Effect—quick bibliography series (1979-1990)
Articles relating to global change.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), Office of Global Programs, Suite 1225, 1100 Wayne Ave., Silver Spring, MD 20910; 301/427-2089, ext. 20.

Available: Climate and Global Change Education Plan; "Reports to the Nation: The Climate Systems and Our Ozone Shield."
Available: Global Change Educational Diskette Project ($1.50). Includes 150-page manual of workshop exercises intended as a tool for the classroom teacher or professor to use directly, or for adaptation to special classroom needs. Designed for use with a Geographic Information System (GIS). Write for more information.

NATIONAL SCIENCE FOUNDATION (NSF), U.S. Global Change Research Program, 1800 G Street, NW, Washington, DC 20550.

Will send information about Global Change Research projects.

SHORELANDS PROGRAM, Douglas J. Canning, PV-11, Washington State Department of Energy (WA DOE), Olympia, WA 98504-8711.

Request list of reports and reprints available on the subject of Sea Level Rise. Most are free.

U.S. DEPARTMENT OF AGRICULTURE, Forest Service, Forest Service Global Change Research Program, National Program Coordinator, Dr. Elvia Niebla, P.O. Box 96090, Washington, DC 20090-6090; 202/205-1561.

Five Regional Program Managers are responsible for coordinating research projects for the Forest Service Global Change Research Program at the regional level.

Pacific Region—Dr. David Sandberg, USDA Forest Service, 3200 Jefferson Way, Corvallis, OR 97331.
Assistant Program Manager—Ms. Kathleen Geyer, USDA Forest Service, 1221 S.W. Yamhill, Suite 200, Portland, OR 97208.

Interior West Region—Dr. Douglas Fox, USDA Forest Service, 240 West Prospect, Ft. Collins, CO 80526.

Northern Region—Dr. Richard Birdsey, USDA Forest Service, 5 Radnor Corporate Center, Suite 200, 100 Mattsonford Road, Radnor, PA 19087.

Southern Region—Ms. Susan Fox, USDA Forest Service, 1509 Varsity Drive, Raleigh, NC 27606.

Forest Products Laboratory—Dr. John Zerbe, USDA Forest Service, One Gifford Pinchot Drive, Madison, WI 53705.

Available: "Forest Service Global Change Research Program: Program Plan Update." October, 1992.
Will send information on Global Change research projects.

U.S. DEPARTMENT OF ENERGY, Environmental Sciences Division, ER-74, Office of Health and Environmental Research, Office of Energy Research, Washington, DC 20585.

Global Change Research: Summaries of research in FY 1992.
Education for Global Change—Graduate level fellowships.

Education for Global Change—Post-doctoral fellowships.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA), Publications (PM221B), 401 M Street, SW, Washington, DC 20460.

Request a publication list on the subject of Global Climate Change and/or Sea Level Rise.
Reports, articles in *EPA Journal,** *EPA Global Climate Change Bulletin,* and State packages available on these topics.
Article titles include: "Greenhouse Effect and Sea Level Rise: The Cost of Holding Back the Sea" (1991); "The Greenhouse Effect and Sea Level Rise and Coastal Wetlands" (1988).

**EPA Journal*: The Greenhouse Effect: What Can We Do About It?, vol. 16, no. 2, 1990.

EPA publishes: *Earth Notes* (a quarterly) for elementary school educators. Subscriptions are free. Write to: Editor, *Earth Notes*, U.S. EPA, 401 M Street, SW (A-107), Washington, DC 20460. Indicate affiliation and category (example: 5th grade teacher, principal etc.).

Also available for educators (from above address):
Environmental Education Materials For Teachers and Young People (grades K-12)—A listing of environmental education materials. It includes:
Earth Trek . . . Explore Your Environment (information and activities)
Books for Young People on Environmental Issues (bibliography)
Listing of Audiovisuals available for some locales.

WASHINGTON STATE DEPARTMENT OF ECOLOGY, Air Quality Program, P.O. Box 47600, Olympia, WA 98504-7600.

This agency publishes a quarterly newsletter entitled Air Lines which offers updated information on Clean Air Washington and other air quality program activities. Fact sheets entitled "Clean Air Washington" are also available.

CENTER FOR CLIMATE CHANGE, Alan Miller, Executive Director, University of Maryland, Executive Building, Suite 4-1, 7100 Baltimore Avenue, College Park, MD 20740.

Will send, on request, 50 pages of selected readings on global warming that cover a broad range of topics, including causes and effects, global climate models, government and corporate responses to predicted changes, and policies proposed to fight climate change.

CENTER FOR ENVIRONMENTAL INFORMATION (CEI), 46 Prince Street, Rochester, NY 14607.

CEI is a private, nonprofit organization funded by membership dues, fees, contracts, grants, and contributions. CEI has developed a multifaceted program of publications, educational programs, and informational services. Membership $25 or $35/year including Sphere newsletter.
Specialized publications:
CEI Sphere-Center's newsletter for members provides information on CEI activities.
Global Climate Change Digest-monthly abstract of world literature on ozone depletion and climate modification. Subscription rate: $325/12 issues.
Acid Precipitation Digest-bimonthly bulletin summarizing news, research, and events concerning the acid rain phenomenon internationally. $235/year-12 issues.

Request: Publications catalogue and order form.

CLIMATE PROTECTION INSTITUTE, 5833 Balmoral Drive, Oakland, CA 94619.

Publishes *Greenhouse Gas-ette*, newsletter of global climate change education. Includes facts, lesson plans, and resources.
Produces computer program titled Global Warming Program (for the MacIntosh) which is an information retrieval program ($15).
Global Systems Science course (high school) currently in production. See Curricula section for more information.

CONCERN, INC., 1794 Columbia Road, NW, Washington, DC 20009.

A nonprofit organization that provides environmental information to individuals, community groups, educational institutions, public officials, and others involved with the environment, public education, and policy development. Primary activity is the development, publication and broad distribution of community action guides.
Global Warming Action Guide ($4 prepaid). Citizens guide for understanding the causes of the global warming threat and for laying out practical steps that can be taken to reduce the threat. Includes facts, recommendations for action, information on alternative energy sources, and information on Federal legislation passed.
Other guides available: Household Waste, Farmland, Drinking Water, Groundwater.

ENVIRONMENTAL ACTION (EA), INC., 1525 New Hampshire Avenue, NW, Washington, DC 20036; 202/745-4879.

A national membership-based organization working for strong State and Federal environmental laws. EA supports strong environmental candidates and names the Congressional incumbents with the worst environmental records to its famous "Dirty Dozen." EA Foundation uses its educational, legal, technical, and organizing expertise to promote environmental protection and assist grassroots organizations. What do they do? Solid Waste Alternatives Project, Energy Conservation Coalition, Toxics Project, Energy Project.
Members receive bimonthly *Environmental Action Magazine* and may request a list of publications.
Membership is $25/year.
Publications (1990) available on Global Warming—Fact Packets on Energy Issues: Global Warming ($4); Global Warming and the Car: A Fact-Filled Book—10 copies for $2.

ENVIRONMENTAL DEFENSE FUND (EDF), 257 Park Avenue S., New York, NY 10010; 212/505-2100.

EDF is a membership organization that uses an aggressive partnership of science, economics, and law to develop lasting solutions to environmental problems. Membership cost: $20/year includes bimonthly newsletter, *EDF Letter*, and updates on EDF projects.

FRIENDS OF THE EARTH (FOE), 218 D Street, SE, Washington DC 20003.

A global, environmental advocacy organization that focuses on how environmental policies affect people. (Merged in 1990 with Environmental Policy Institute and the Oceanic Society).

Membership is $25/year. Benefits include: news magazine and discounts on FOE merchandise. Members enrolled in the activist program receive periodic *Action Alerts* about key legislative initiatives and other important activities. Environmental Resource Guide includes information on books, curriculum materials, magazines, and newsletters, film sources, workshop strategies, etc.
Products and Publications list includes books, posters, labels, grocery bags, t-shirts.

GLOBAL FOUNDATION, INC., P.O. Box 24-8103, Coral Gables, FL 33124-8103; 305/669-9411.

A nonprofit corporation consisting of "great senior men and women of science and learning and of outstanding achievers and entrepreneurs from industry, governments and international organizations, along with promising enthusiastic young people." The foundation concentrates on major global problems and teaches the public, universities, governments, and national and international institutions by means of television, films, books, other publications, lectures, and conferences. Individuals admitted to the foundation pay an annual membership fee of $50. Board of Trustees includes Lord Solly Zuckerman (Nobel Laureate).

GLOBAL TOMORROW COALITION (GTC), 1325 G Street, NW, Suite 1010, Washington, DC 20005-3104; 202/628-4016.

A not-for-profit alliance of nearly 100 U.S. organizations, institutions, corporations, and individuals committed to acting today to assure a more sustainable, equitable, and humane global future using a nonpartisan, nonconfrontational approach.
GTC resources for sustainable development include curriculum materials, essays, education packets such as:

The Global Ecology Handbook: What You Can Do About The Environmental Crisis. Basic facts about global population, resource, and environmental problems. ($15).

The Global Ecology Handbook Study Guide (supplement to handbook)—written for use in high school and undergraduate college courses—17 units. ($15—spiral bound or looseleaf).

Global Issues Education Set - 6 teacher units for elementary and secondary levels: A Global Awakening, Population, Biological Diversity, Tropical Forests, Ocean and Coastal Resources, and Sustainable Development-based on handbook. Lesson plans and activities emphasize interactive learning models through participation in hands-on activities, group discussions, role-playing, simulations, and individual creativity. ($65).

Sustainable Development: A Guide to Our Common Future. Summary of key recommendations on international economy by the World Commission on Environment and Development. ($7 paperback).

Sustainable Development: A New Path for Progress. Examines concept of sustainable development and its action and policy significance for the United States. ($15 paperback).

Sustainable Development Bibliography. ($5).

Race to Save the Planet videotapes. ($8 each or $25 rental fee for entire series—10 cassettes).

Race to Save the Planet Community Discussion Guide. ($6).

Environmental Career Packet. ($2).

GREENHOUSE ACTION, Patti Lowe, P.O. Box 16743, Seattle, WA 98116.

Newsletter: *Warming Trends* provides information about climate change and how the Pacific Northwest is addressing issues. Fall 1992 newsletter included these articles: "Seattle Addresses Climate Change," "How Do We Adapt to Climate Change," "Insulation and CFC's."

GREENPEACE, USA, Public Information Coordinator, 1436 U Street, NW, Washington, DC 20009.

Send for Publications and Video Catalog which includes: Global Warming: The Greenpeace Report (554 pages, with charts and diagrams—$14.95), back issues of *Greenpeace Magazine*, etc. Also available: *Greenpeace Examiner* (quarterly); fact sheets; *Action Alerts*; newsletter information for children on what they can do.

NATIONAL AUDUBON SOCIETY, Audubon Activist, Box AA, 950 Third Avenue, New York, NY 10022; 212/546-9100.

Audubon Activist is published 10 times per year. This newspaper highlights/updates readers on current issues and provides activist information (who to write or call) on behalf of environmental issues ($20/year).

NATIONAL ENERGY EDUCATION DEVELOPMENT PROJECT (NEED), P.O. Box 2518, Reston, VA 22090; 703/860-5029.

NEED provides materials on all major energy sources to K-12 teachers, conducts an annual awards program to recognize achievements in energy education, and provides training for students and teachers. Their magazine, *Energy Exchange*, is published 3 times a year and is free to schools. NEED is supported through State and Federal grants, corporate contributions, and the sale of program materials.

SAVE THE RAINFOREST, 604 Jamie Street, Dodgeville, WI 53533; 608/935-9435.

Publishes yearly *Teacher's Guide to Environmental Action* that includes reports, registration information for rainforest ecology courses, conservation projects, lesson plans, speakers list, information sheets, resources, letter writing campaigns, and information on what you can do. Information about participating in rainforest land purchases also is available.

SOLAR BOX COOKERS INTERNATIONAL (SBCI), 1724 11th Street, Sacramento, CA 95814.

SBCI provides educational materials and training programs about solar box cookers and works with organizations around the world to promote their distribution. Request list of materials available from SBCI (how to guides, patterns, slides/videos). Membership (plus newsletter) is $35 at the supporter level.

TREE PEOPLE, School Education Program, 12601 Mulholland Drive, Beverly Hills, CA 90210.

A nonprofit organization. Its mission is to help heal the environment by challenging citizens of California to participate in the planting, care, and appreciation of trees and urban forests. Provides citizens with educational training and support for community activity. Membership at $25/year includes newsletter *Seedling News* (information on "best" trees, activities). This organization can serve as a springboard for other areas to develop programs that combat pollution and smog.

UNION OF CONCERNED SCIENTISTS (UCS), ED Publications, 26 Church Street, Cambridge, MA 02238.

UCS is a nonprofit organization of scientists and other citizens concerned about the impact of advanced technology on society. Programs include research, public education and advocacy, and litigation. Sponsors receive quarterly report/newspaper entitled *Nucleus* that highlights global issues and action on Capitol Hill, includes an "activists corner," and informs of new UCS publications; they may become part of Concerned Citizens Action Network and receive periodic alerts about particular action needs. Suggested donation: $20.

Available: *Resources Guide* (includes recommended reading, bibliography/recommendations of curriculum/activities, audiovisual materials, private/nonprofit organizations); briefing papers on environmental issues and informational pamphlets on global issues; suggested environmental activities for high school students. Single copies are free with a self-addressed, stamped envelope.
Curriculum: *Renewables Are Ready* Teacher's Guide. A high school curriculum that contains experiments, simulations, and other activities for science and social studies classrooms. It also includes a glossary, resource directory, and a section on action projects that can promote greater use of renewables ($5 per copy); poster exhibit $14.

WORLD RESOURCES INSTITUTE, 1709 New York Avenue, NW, Washington, DC 20006.

Pamphlet available: *Changing Climate: A Guide to the Greenhouse Effect.*

Also available:
World Resources 1992-1993: A Guide to the Global Environment ($19.95).

World Resources Data Diskette—includes text of World Resources 1992-1993 on a diskette ($119.95).

Teacher's Guide to World Resources ($4.95)—aimed at high school teachers: lesson plans, student activities, and handouts on topics from *World Resources 1992-1993.*

WORLD WILDLIFE FUND, 1250 24th Street, NW, Washington, DC 20037; 202/293-4800.

Publication available: "Can Nature Survive Global Warming?" (February 1992).

Organizations That Involve Kids

CHILDREN'S EARTH FUND, Box 2335, 175 5th Avenue, New York, NY 10010; 212/727-4493.

An organization that helps middle school-level kids work on environmental action activities and to take action to secure Earth's future.
Beat the Heat, the CO_2 Challenge-Publication/educator's kit for teaching children and their parents about the effects of reducing CO_2.

EARTH'S BIRTHDAY PARTY, 170 Joralemon Street, Brooklyn, NY 11201; 718/834-0516.

EBP is a network of elementary teachers that promotes the annual celebration of the Earth's birthday to give kids an opportunity to care for the Earth.

EBP coordinates a gift program, a fund-raising effort in which students work to buy and save threatened habitats. The 1993 Adopt-an-Acre Program will focus on purchasing threatened acres of rainforest in Brazil. One hundred percent of the money students raise will go directly toward the purchase and conservation of the rainforest. The program guide contains information about the rain forest and fund-raising suggestions.

GLOBAL RELEAF, The American Forestry Association, P.O. Box 2000, Washington, DC 20013; 202/667-3300.

Global ReLeaf is an education and action campaign that encourages and helps people in planting and caring for trees to improve the environment.

Available: *Global ReLeaf Action Guide* and *Global ReLeaf Report*.

New publication: *Growing Greener Cities: The Global ReLeaf Tree Planting Handbook* (Living Planet Press, April 1992). An easy-to-understand guidebook to rehabilitating the urban forest. Available in bookstores or can be purchased for $7.95 plus $1 shipping by calling American Forests at 1-800-368-5748.

GLOBAL RESPONSE (GR), Environmental Action Network, P.O. Box 7490, Boulder, CO 80306-7490; 303/444-0306.

GR is an international letter-writing network focusing on the transfer of pollution and/or polluting technologies between countries and the exploitation of resources by multinational companies. Subscriptions: $12/year (covers cost of printing and mailing newsletters).

GRAction is a monthly that highlights a specific environmental threat, recommends action to take, and gives the names and addresses of the corporations responsible.

Young Environmentalist's Action is a simplified, larger-print version of GRActions for use by elementary and junior high school students.

KIDS AGAINST POLLUTION (KAP), P.O. Box 775, Closter, NJ 07624.

An organization which educates the public about environmental issues by identifying local problems, applying creative solutions and ultimately effecting worldwide change. Formed in 1987 by a teacher and his fifth grade class studying environmental issues.

Members receive a start-up kit including: a membership certificate; action ideas for school, community, and State; information on the latest environmental issues; KAP catalog of t-shirts, bumper stickers, buttons, and other items. Membership is $10.

KIDS F.A.C.E. (Kids For A Clean Environment), P.O. Box 158254, Nashville, TN 37215; 615/331-7381.

A nonprofit corporation recognized as an effective educational children's organization by the Girl Scouts, the American Lung Association, Renew America's Environment Success Index, and the U.N. Environmental Programme.
Free membership includes membership booklet, *Our World, Our Future—A Kid's Guide to Kids for a Clean Environment*, a membership certificate, and a bi-monthly newsletter (Kids F.A.C.E. Illustrated), and hands-on project ideas.

KIDS FOR SAVING EARTH (KSE), P.O. Box 47247, Plymouth, MN 55447.

A nonprofit organization dedicated to educating preschool through high school-age children about the environment. KSE is funded entirely by contributions

from concerned individuals and businesses. Club members receive a full-color club certificate plus a newspaper filled with ideas and activities from KSE members all over the world.

Merchandise catalog sells various items: stickers, pins, book bag, lunch bag, mugs, activity action guide, buttons, and t-shirts. All net proceeds from KSE merchandise go directly to Kids for Saving Earth.

KIDS IN NATURE'S DEFENSE CLUB, National Association for Humane and Environmental Education (NAHEE), 67 Salem Road, E. Haddam, CT 06423-0362.

NAHEE is the youth education division of The Humane Society of the United States. Its focus is primarily on the humane treatment of animals in the environment. Publications catalog includes items on habitat and the environment.

Offerings include: *KIND News* - monthly student newspaper with teaching guide (grades 2-6). Teaches respect for each other, animals, and the environment. Subscription includes teacher's magazine with reproducibles, posters, games, daily calendar announcements, and lesson plans. ($25/year). Sample copy of *KIND News* available upon request.

HSUS Student Action Guide is designed to assist secondary school students in grades 7-12 who want to form an Earth/animal protection club in their school or community. Sample copy free.

SCIENCE BY MAIL, Museum of Science, Science Park, Boston, MA 02114-1099.

An international program developed by the Museum of Science in Boston that teams volunteer scientists with children (grades 4-9) in creative, problem-solving exercises. Children receive three science challenge packets a year designed to foster an interest in science and elicit creative solutions. The solutions are sent to volunteer scientist pen pals who respond to the children.

Challenge packets are sent in December, February, and April. Challenges in the 1992-1993 school year encouraged children to explore the topics of photography, cartography, and simple machines. Membership is $44.

STUDENT ENVIRONMENTAL ACTION COALITION (SEAC), P.O. Box 1168, Chapel Hill, NC 27514-1168; 919/967-4600.

SEAC is a grassroots organization of student environmental groups at more than 2,000 high school and college campuses across the country working together to build a strong student movement to save the planet. Through SEAC, environmental groups share resources, educate each other, build coalitions, and challenge the limited mainstream definition of environmental issues.

SEAC publications:

Threshold: a monthly newsletter that is an information source and a communication tool.

Campus Ecology: a comprehensive guide to assessing the environmental state of a campus and fighting to make it more responsible.

SEAC also publishes *Organizing Guides* (for both college and high school students) and issues fact sheets, resource packets, and a book that describes 25 successful projects accomplished by student environmental groups around the country.

Cost: individual students/low income $15/year; student groups $35/year.

Newsletters on Global Change

Food, forestry and fiber In a Changing Environment. USDA Global Change Research Program Newsletter. To be added to the distribution list, contact: Linda Greczy, USDA Global Change Program Office, 1621 N. Kent St., Room 60 LL, Arlington, VA 22209; 703/235-9018. Fax: 703/235-9046.

Greenhouse Gas-ette. Newsletter of global climate change education. Includes facts, lesson plans, and resources. Published by Climate Protection Institute, 5833 Balmoral Drive, Oakland, CA 94619.

See "Organizations" for more newsletters.

Curricula

Available from **CLIMATE PROTECTION INSTITUTE,** Richard Golden, Coordinator-Educator's Network Project, 5833 Balmoral Drive, Oakland, CA 94619.

Global Systems Science: A course currently under development for high school students that emphasizes how scientists from a wide variety of fields work together to understand significant problems of global impact.

The course is divided into 5 volumes consisting of student text, home investigations, and laboratory experiments. The volumes guide a one-semester, integrated science course.

Earth Science	Volume 1	Global climate change
Earth Science	Volume 2	Climate and life
Physics	Volume 3	Energy and conservation
Biology	Volume 4	Ecological systems
Chemistry	Volume 5	Ozone in the atmosphere

Each volume includes laboratory experiments, student activities, descriptions of recent scientific work, historical background, some consideration of the political and economic issues, and ethical considerations.

Contact Climate Protection Institute to receive the newsletter which will keep you informed of the progress of the development of this curriculum, parts of which are in the pilot stage. Note: Climate Protection Institute is planning workshops in the near future.

Other teaching materials available from Climate Protection Institute on global climate change: For High School Social Science Classes (20 science activities including experiments). ($9.85).

For High School Social Studies Classes (12 lesson plans with 21 activities). ($9.85).

Available from **EARTH DAY RESOURCES,** 116 New Montgomery St., Suite 530, San Francisco, CA 94105; 415/495-5987 or 1-800-727-8619. Membership contribution: $15-$100.

Earth Day Lesson Plans: Grades K-6 and 7-12. Includes fact sheets, lesson outlines, discussion questions, home exercises, resources, and ideas for school involvement. ($8).

Projects for the Planet: A kit developed to help organize long-term environmental projects. Each kit has a "how-to" booklet and posters to help promote the program. ($5 each).
Kit #1: how to organize a recycling program for your workplace.
Kit #2: how to organize a ridesharing program for your workplace.

Planning and Running Your Environmental Event: A manual for organizing your event, including financing and publicity. ($8).

Fact Sheet Set #1: Global warming, ozone depletion, acid rain, tropical rain forests, pesticides, water conservation, tree planting, and recycling. ($3).

Fact Sheet Set #2: Agriculture, food choices, American forests, the automobile, energy, household hazards, composting, and population growth. ($3).

Workplace Audit: A brief guide for people who want to start addressing environmental problems in their office or other workplace. ($5).

Campus Audit: A thorough guide for students and employees of universities who want to identify and solve environmental problems on their campus. ($5).

Available from **GEMS (Great Explorations in Math and Science) CURRICULUM,** Lawrence Hall of Science, University of California, Berkeley, CA 94720. 510/642-7771.

Global Warming: The Greenhouse Effect: Grades 7-10. ($12.50).

Acid Rain: Grades 6-10. ($12.50).

These guides are excellent resources for teaching about some of the environmental effects of energy production. Each guide contains 8 interdisciplinary, group learning activities. Instructions are explicit and experiments are all diagramed. Although these activities do not deal directly with energy issues, they can be used to provide students with an understanding of the environmental benefits of alternatives to fossil fuels.

Available from **GLOBAL TOMORROW COALITION,** 1325 G Street, NW, Suite 1010, Washington, DC 20005-3104; 202/628-4016.

The Global Ecology Handbook: What You Can Do About the Environmental Crisis. Basic facts about global population and resource and environmental problems. ($15).

The Global Ecology Handbook Study Guide. Supplement to the handbook. Written for use in high school and undergraduate college courses. Contains 17 units. ($15 spiral bound or looseleaf).

Global Issues Education Set: Six teacher units for elementary and secondary school levels: A Global Awakening, Population, Biological Diversity, Tropical Forests, Ocean and Coastal Resources, and Sustainable Development. Based on the handbook. Lesson plans and activities emphasize interactive learning models through participation in hands-on activities, group discussions, role-playing, simulations, and individual creativity. ($65).

Available from **LAWRENCE LIVERMORE NATIONAL LABORATORY.** Contact: Dolores Doyle, Education Program Specialist, Lawrence Livermore National Laboratory, Livermore, CA 94551-9900; 510/422-1100.

The Greenhouse Effect and Global Climate Change. For grades 7-10. A 17-day unit for high school focusing on causes of climate change. Curricula for middle school and elementary school levels are currently being developed.

Workshops are scheduled to have begun nationwide in the summer of 1993. The workshops are interdisciplinary and are taught by the team of high school teachers who developed the curriculum. Contact Lawrence Livermore National Laboratory if you are interested.

> Because we will have choices, the critical need is for us all to be better informed and educated about our environment and our world. It is the responsibility of everyone to be ready to debate and participate in the decisions and choices that must be made concerning this grand 'geophysical experiment.' It is for this reason that these materials were prepared.
>
> M. MacCracken

Available from **MILLIKIN PUBLISHING CO.,** 1100 Research Boulevard, P.O. Box 21579, St. Louis, MO 63132-0579.

Environmental Series: Environmental Studies. For grades 3, 4, and 5. ($7.95).
Titles include:
Air Quality and Pollution
Land Resources and Pollution
Wildlife Populations and Resources
Recycling
Water Quality and Pollution
Energy and the Environment
Human Populations and Resources
Global Environmental Awareness

Available in choice of formats:
1. **Poster books**: four 17" x 22" posters, 12 reproducible pages, 4-page teacher's resource guide.
2. **Study prints**: four 13" x 18" prints with background information on the back, 12 reproducible pages, 4-page teacher's resource guide.
3. **Transparency books**: 4-color transparencies, 12 reproducible pages, 4-page teacher's resource guide.

Available from **NATURAL RESOURCES DEFENSE COUNCIL,** 40 West 20th Street, New York, NY 10011; 212/727-4486.

The Rainforest Book: How You Can Save the World's Rainforests. ($5.95 each, 2-9 copies $4.75, 19-24 copies $4).

Teacher's Guide to the Rainforest Book. (8 pages, free with order of 10 rainforest books).

Amazon Days, Amazon Nights. Forty-minute cassette of sounds from Brazil's Amazon jungle. ($7.95).

Available from **PROJECT ATMOSPHERE,** 1701 K Street, NW, Suite 300, Washington, DC 20006-1509. Write for more information.

Project Atmosphere: The educational initiative of the American Meteorological Society to foster the teaching of atmospheric topics across the K-12 curriculum. Provides a network of Atmospheric Education Resource Agents who provide a point of contact for teachers seeking information on atmospheric-related educational matters.

Available from **TREE PEOPLE,** School Education Program, 12601 Mulholland Drive, Beverly Hills, CA 90210.

A nonprofit organization to promote planting of trees to combat smog pollution in urban areas.

Classroom Activities on Trees and Nature Awareness. ($5).

Available from **UNION OF CONCERNED SCIENTISTS,** ED Publications, Attention: Lori Walker, Public Information Officer, 26 Church Street, Cambridge, MA 02238.

Renewables Are Ready—Teacher's Guide: A high school curriculum that contains experiments, a glossary, a resource directory, and a section on action projects that can promote greater use of renewables. ($5 per copy).

Available from **ZEPHYR PRESS,** P.O. Box 12448 W., Tucson, AZ 85732-3448.

The Future of Our Tropical Rainforest. Our Only Earth Series. A Curriculum for Global Problem Solving. A teaching guide. ($19.95). Units are designed to provide students with knowledge and skills to actively address major global issues. Teacher's guide includes unit overview; letter writing suggestions; three activities; fact cards; instructions for scavenger hunt; instructions for a geography activity; instructions for research and independent study; materials for a youth summit on tropical rainforests; and a bibliography of 64 books, games, and other resources on tropical deforestation.

Curricula in Development

EARTH SYSTEMS EDUCATION PROGRAM, The Ohio State University, 059 Ramseyer Hall, 29 West Woodruff Avenue, Columbus, OH 43210-1177; 614/292-7888.

Activities for the Changing Earth System (ACES). Still in development. Activities are aimed at middle school and high school students. Price is unknown.

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS, Committee on Teaching of Science, Professor J. Stoltman, Department of Geography, Western Michigan University, Kalamazoo, MI 49008-5053; 616/387-3429.

Education in Global Change Project. Still in development. Price is unknown.

MANAGEMENT TECHNOLOGY, 200 SW 35th Street, Corvallis, Oregon 97335; 503/754-4664.

Global Change Curriculum. For grades 8-10. Still in development. Price is unknown.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA), Sandra Henderson, Environmental Research Lab, 200 SW 35th Street, Corvallis, OR 97335; 503/754-4301.

Global Change Curriculum. For grades 8-10. Still in development. Price is unknown.

UNIVERSITY OF RHODE ISLAND, Att: Lynne Carter Hanson, Special Assistant for Global Change, Graduate School of Oceanography, URI/Narragansett, RI 02882; 401/792-6211.

In-Class Global Change Education Activities (K-12). Still in development. Price is unknown.

Selected Articles

There are numerous publications and articles in periodicals on global change. The articles listed represent a small selection.

"When Nature Loses Its Cool," John C. Ryan. *World Watch*, vol. 5, no. 5, September-October 1992.

"Greenhouse Science Survives Skeptics," R. Kerr; *Science*, May 1992.

"There's a New Offering on Campus: Global Change 101," A. Gibbons, *Science*, May 1992.

"Responding to Global Change." Report on Sigma Xi Forum; *American Scientist*, March-April, 1992.

"Global Change, Pt. I & II," *Marine Technology Society Journal*, vol. 25 no. 3 and 4, Fall 1991.

"Conserving Biodiversity in Managed Forests," Hansen et al.; *BioScience*, June 1991.

American Forests, Global Issue, July-August 1991.

"Slowing Global Warming," Christopher Flavin, *American Forests*, May-June 1990.

"The Greenhouse Questions," Alston Chase, *Outside Magazine*, October 1990.

"Saving Tropical Rain Forests Through Teacher-Student Activism," *American Biology Teacher*, September 1990.

"What Caused the Mass Extinction?" *Scientific American*, vol. 263, no. 4, October 1990.

"Under the Sun—Is Our World Warming?" *National Geographic*, vol. 178, no. 4, October 1990.

"Warming Up to STS. Activities to Encourage Environmental Awareness," *Science Teacher*, September 1990.

"Global Warming Trends," *Scientific American*, August 1990.

"A Character Sketch of Greenhouse," D. Rind, *EPA Journal*, January-February 1989.

Selected Books of Interest

"Global Climatic Change," Houghton and Woodwell, *Scientific American*, April 1989.

"Atmospheric CO_2: Causes, Effects, and Options," W. Nierenberg, *Chemical Engineering Progress*, August 1989.

"The Global Warming Panic," Warren Brookes, *Forbes*, December 25, 1989.

Oceanus, Summer 1989. Themed issue: Oceans and Global Warming.

Scientific American, September 1989. Themed issue: Managing planet Earth.

"Global Warming," *Popular Science*, August 1989.

"New Waves in Marine Science Symposium: Threat to the Marine Environment," Betty Allen, *Current: Journal of Marine Education*, vol. 8, no. 4, 1989. Includes five sets of activities on environmental threats.

"Gaia: The Implications for Industrialized Societies," Peter Bunyard, *Ecologist*, vol. 18, no. 6, 1988.

BioDiversity by Wilson and Peter (1990) ($19.95). National Academy of Sciences, National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418.

Global Warming: Are We Entering the Greenhouse Century? by Stephen Schneider (1990) ($12.95).
Random House Books, New York, NY.

Global Warming: Understanding the Forecast ($32.95).
Abbeville Press, 488 Madison Avenue, New York, NY 10022; 1-800-227-7210.
A stand-alone book, companion to the multimedia interactive museum exhibit of the same name.

Greenhouse Earth: Tomorrow's Disaster Today by Jon Erickson (1990) ($14.95).
Tab Books, Blue Ridge Summit, PA.
Erickson explains what is happening to the land, sea, and atmosphere as humankind continues to pollute the environment.

Growing Greener Cities: The Global ReLeaf Tree-Planting Handbook (1992) ($8.95).
Living Planet Press, 1-800-368-5748.
An easy-to-understand guidebook to rehabilitating the urban forest. Available in bookstores or can be purchased for $7.95 plus $1 shipping by calling American Forests at the toll-free number above.

Managing Planet Earth: Readings from Scientific American (1989) ($12.95).
W.H. Freeman and Co., New York, NY.

Save Our Planet: 750 Everyday Ways You Can Help Clean Up the Earth by Diane MacEachern (1990) ($12.45).
Dell Publishing Group, Inc., New York, NY ($9.95 + $2.50 shipping and handling).

Reviewed Videos

Global Warming: Hot Times Ahead (JS) (1990) (3 formats/3 individual prices).
Churchill Films, 12210 Nebraska Avenue, Los Angeles, CA 90025; 1-800-334-7830. 23 minutes.
Comes in 3 formats: VCR—$350, 16mm—$515, laser disk—$295.
This film addresses conditions in the United States and contributions of other countries. Strategies for personal involvement are suggested. Host/narrator is a familiar television face, Skippy from "Family Ties." Intended for grades 7-adult.

Greenhouse Crisis: The American Response (JS) (1989) ($14.95).
Available from Union of Concerned Scientists, 26 Church Street, Cambridge, MA 02238; 617-547-5552. 11 minutes.
Well done, general film that covers global warming: What is global warming? What could happen with a global warming effect? Strategies for change: global effort and alternate energy sources. It includes notes and discussion guide that encourages critical thinking about the following topics: global warming debate, potential impact, role of individual, role of community, and role of government.

The Greenhouse Effect (JS) (1990) ($59.95).
Ward's, 5100 W. Henrietta Road, P.O. Box 92912, Rochester, NY 14692-9012; 716/359-2502. 17 minutes.
Scientists explain how global warming is caused using models and computer simulation/virtual reality animation. The video includes a description of the carbon cycle, highlights of research, explanations of projections of climate change, and prevention and elimination of excess carbon dioxide. A simple teacher's guide is included containing a summary, glossary, five discussion points, and suggestions for class activities.

Warning on the Wind (JS) (1987) ($75).
Center for Environmental Study, 143 Bostwick NE, Grand Rapids, MI 49503; 616/771-3935. 28 minutes.

This film highlights the effects of toxic fallout around the Great Lakes area, focusing on Isle Royale. It explores results of research on airborne pollutants and industry, and looks at how to move toward an ecosystem approach to attack problems in this area.

Although the focus is on the Great Lakes regions, it will provide Pacific Northwest viewers with insight into possible future effects of pollutants in their areas if proper action or regulation is not undertaken. No teacher's guide is included.

Legend
JS = Junior High School

Unreviewed Videos

Fate of the Earth. Planet Earth Series. Films Incorporation, 5547 Ravenwood Avenue, Chicago, IL 60740.

Global Environmental Change: An Annotated Bibliography for Visual Media. Available from Louisiana Sea Grant College Program, Louisiana State University, Baton Rouge, LA 70803.

Global Environmental Change: Interviews with the Experts
In a series of special video cassettes, 12 experts describe the scientific, sociological, political, and economic impacts of predicted global environmental change. The interviews, which run approximately 30 minutes each, explore the changes, projections, and ends associated with the effects that will be felt for generations to come.
1. *Science*
Overview of Global Environmental Change: The Science and Social Science Issues (W. Kellogg).
Atmospheric Chemistry: Causes and Effects (F. Sherwood Rowland, University of California at Irvine).
The Role of the Oceans in Global Environmental Change (B. Moore III, University of New Hampshire).

2. *Climate and Society*
What Is the Role for the Press in Global Environmental Change? (C. Alexander, Senior Editor, *Time* Magazine).
Population and Global Environmental Change (W. Clark, Harvard University).
Energy: Its Use and Effects (I. Mintzer, University of Maryland)
Agriculture, Forestry and Food Security (G. Evans, U.S. Department of Agriculture).
Tropical Forests (P. Sanchez, North Carolina State University).
Potential Health Effects of Global Environmental Change (J. Fouts, National Institute of Environmental Health Sciences).

3. *Policy Options and Mechanisms*
Mitigation Options and Economic Consequences (A. Miller, University of Maryland).
National Legislation and Other Options (C. Schneider, former Congresswoman of Rhode Island).
International Treaties and Activities (A. Hecht, U.S. Environmental Protection Agency).

For more information, contact: Lynne Carter Hanson, Special Assistant for Global Change, University of Rhode Island Graduate School of Oceanography, Narragansett, RI 02882-1197.
(Cost—$199.95; academic/nonprofit—$119.95).

Global Sea Level Rise. Coronet Films, 420 Academy Drive, Northbrook, IL 60062.

Oceans and Climate. Coronet Films, 420 Academy Drive, Northbrook, IL 60062.

Our Common Future. Global Tomorrow Coalition, Attn: Ms. Geri Feron, 1324 G Street, NW, Suite 915, Washington DC 20005-3104.

The Silent Explosion. A presentation of unchecked population growth. Population Institute, 110 Maryland Avenue, NE, Washington, DC 20002.

Computer Network

ECONET (Environmental Computer Network for the Planet), 18 DeBoom Street, San Francisco, CA 94107; 415/441-0220.

EcoNet offers easy-to-use tools for posting events on international bulletin boards, preparing joint projects through electronic conferences, and finding and discussing the latest information on environmental topics.

Onetime $15 sign-up fee provides a user manual, private account, password, and 1 free hour of off-peak connect time each month (additional connect time is charged at $5/hour in off-peak hours and $10/hour in peak hours).

Printed on Recycled and Recyclable Paper